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10/525,689	08/24/2005	Bruce F. Monzyk	BATZ 2 00001-3(II)-3 US	7655
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Fay Sharpe LLP 1228 Euclid Avenue, 5th Floor The Halle Building Cleveland, OH 44115			EXAMINER DINH, BACH T	
			ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/525,689	Applicant(s) MONZYK ET AL.	
	Examiner BACH T. DINH	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 April 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 and 35-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-33 and 35-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Summary

1. This is the response to the communication filed on 04/29/2009.
2. All of previous rejections are withdrawn in view of applicant's amendment to the claims and the filed terminal disclaimer.
3. Claims 1-33 and 35-43 remain pending in the application.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

5. Claims 1-33 and 35-43 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-32 of U.S. Patent No. 7,527,770. Although the conflicting claims are not identical, they are not patentably distinct from each other because

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both the U.S. Patent No. 7,527,770 and current application recite the photolytic apparatuses with equivalent structures.

Claim Rejections - 35 USC § 112

6. Claims 1-15, 33 and 39-43 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites "an artificial light" and the originally filed specification recites the light source can be sun light, UV light, laser light and incandescent light (paragraph 109 in page 9); however, the term "artificial light" is opened to light sources other than the ones listed in paragraph 109 of the originally filed specification. Therefore, claim 1 and its dependent claims 2-15, 33 and 39-43 are rejected as new matter for the originally filed specification does not provide explicit support for the term "artificial light".

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 1-14, 33 and 39-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nozik (US 4,011,149) in view of Grantham (US 4,203,814) with further evidence provided by Murdoch et al. (US 5,362,373) and Nieda et al. (US 2003/0076028). Grantham is cited and relied on for the first time in this office action. Its use is necessitated by applicant's amendment to the claims.

Addressing claims 1-3, Nozik discloses a photolytic apparatus comprising:

A photolytic cell (figure 3) having an anode compartment containing, in sequence, a transparent window or waveguide (glass top 31), an anode (electrical conductor 32), a photo-reactive surface (electrode 33 made of TiO_2 , 7:67-8:2) having the ability to convert water to oxygen (7:60-64), and an anolyte flowpath (6:65-68, liquid electrolyte flow through the cell and in contact with layer 33); and a cathode compartment with a cathode (counter electrode 34 made of platinum, 9:15-16) having the ability to convert carbon dioxide, electrons, and hydrogen ions into a solid or liquid medium (6:36-39, the hydrogen ions react with the electrons at the counter-electrode to form hydrogen; Murdoch discloses carbon dioxide reacts with hydrogen in the presence of noble metal catalyst, which includes platinum, to form methane and water, 4:20-23;

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therefore, the platinum counter-electrode of Nozik has the ability to convert carbon dioxide, hydrogen ions and electrons into a solid or liquid medium); and

A light source (solar radiation 17, 1:7-10) for providing light photons to the photolytic cell and activating the photo-reactive surface (3:14-27);

Nozik is silent regarding an artificial light source.

Grantham discloses a photolytic device for generating hydrogen gas; wherein, the light source can be solar radiation, laser radiation or light emitting diodes (3:8-14).

At the time of the invention, one with ordinary skill in the art would have found it obvious to modify the photolytic apparatus of Nozik with the laser radiation or light emitting diodes as complementary artificial light source to the solar radiation as disclosed by Grantham because the artificial light source allows one carry out hydrogen generation even when the sun is down. Furthermore, using the artificial light source also allows one to adjust the radiant energy to a proper wavelength and sufficient intensity for a particular material employed in the photolytic apparatus (Grantham, 3:8-52).

Addressing claim 4, Nozik discloses the cell having a bandgap which ranges from about 1.3 to 5.0 eV (2:31-37), which includes the bandgap energy of visible light spectrum of 1.65 to 3.1 eV and overlaps the bandgap energy of ultraviolet light spectrum of 3.0 eV and up. Therefore, Nozik discloses the cell can absorb radiation from the visible light and ultraviolet light spectrum.

Nozik and Grantham are silent regarding the light source is an ultraviolet light at 350-500 nm.

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Grantham discloses the radiant energy is adjusted to have proper wavelength and intensity that match the bandgap energy of the semiconducting material (3:8-31).

At the time of the invention, one with ordinary skill in the art would have found it obvious to modify the photolytic device of Nozik by experimenting with the wavelength of the artificial light disclosed by Grantham because doing so would allow one to find light with wavelength range that match the characteristic of the semiconductor material (Grantham, 3:8-31). Moreover, the semiconductor material of Nozik has the bandgap energy in the ultraviolet light spectrum as addressed above; therefore, it is in the best interest of one skilled in the art to adjust the wavelength of the artificial light to include the ultraviolet light spectrum to match the bandgap energy of the semiconductor material. Hence, one would have arrived at the claimed ultraviolet light at 350-500 nm when performing routine experiment to optimize the wavelength of the light source to match the bandgap energy of the semiconductor material of the photolytic cell, thereby increasing energy conversion efficiency.

Addressing claims 5-6, Nozik discloses the titanium oxide layer 33, when photolytically irradiated, converts water to hydrogen ions and electrons (6:30-33) and Nieda further shows that TiO_2 when irradiated also converts water to hydrogen peroxide (Nieda, [0040]).

Addressing claim 7, Nozik discloses the electrons are conducted from the anode to the cathode (6:30-33).

Addressing claims 8-9, where the recited disproportionation catalyst is not claimed as part of the structure of the claimed apparatus, the manner or method in which such apparatus is to be utilized is not germane to the issue of patentability of the apparatus itself.

Addressing claims 10 and 33, the subject matter of current claims refers to the process in which carbon dioxide and hydrogen ion are converted, which is not claimed as part of the structure of the claimed apparatus. Therefore, the manner or method in which carbon dioxide and hydrogen ion are converted is not germane to the issue of patentability of the apparatus itself.

Addressing claims 11-12, where the recited substrate is not claimed as part of the structure of the claimed apparatus, the manner or method in which such apparatus is to be utilized is not germane to the issue of patentability of the apparatus itself.

Addressing claim 13, Nozik discloses the photo-reactive surface comprises a light transparent substrate (transparent conductor, 8:49-54) and a photolytic coating (thin film of semiconductor material, 7:67-8:8).

Addressing claim 14, Nozik discloses the titanium oxide layer 33, when photolytically irradiated, converts water to hydrogen ions and electrons (6:30-33) and Nieda further

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shows that TiO_2 when irradiated also converts water to hydrogen peroxide (Nieda, [0040]).

Addressing claim 39-40, the recited "confined volume" is not claimed as part of the structure of the claimed apparatus, the manner or method in which the apparatus is to be utilized is not germane to the issue of patentability of the apparatus itself.

Addressing claim 41, Nozik discloses the cell having a bandgap which ranges from about 1.3 to 5.0 eV (2:31-37), which includes the bandgap energy of visible light spectrum of 1.65 to 3.1 eV and overlaps the bandgap energy of ultraviolet light spectrum of 3.0 eV and up. Therefore, Nozik discloses the cell can absorb radiation from the visible light. Nozik and Grantham are silent regarding the light emits visible light.

Grantham discloses the radiant energy is adjusted to have proper wavelength and intensity that match the bandgap energy of the semiconducting material (3:8-31).

At the time of the invention, one with ordinary skill in the art would have found it obvious to modify the photolytic device of Nozik by experimenting with the wavelength of the artificial light disclosed by Grantham because doing so would allow one to find light with wavelength range that match the characteristic of the semiconductor material (Grantham, 3:8-31). Moreover, the semiconductor material of Nozik has the bandgap energy in the visible light spectrum as addressed above; therefore, it is in the best interest of one skilled in the art to adjust the wavelength of the artificial light to include the visible light spectrum to match the bandgap energy of the semiconductor material.

Addressing claim 42, Nozik discloses the cell having a bandgap which ranges from about 1.3 to 5.0 eV (2:31-37), which includes the bandgap energy of visible light spectrum of 1.65 to 3.1 eV and overlaps the bandgap energy of ultraviolet light spectrum of 3.0 eV and up. Therefore, Nozik discloses the cell can absorb radiation from the ultraviolet light spectrum.

Nozik and Grantham are silent regarding the light source emits ultraviolet light.

Grantham discloses the radiant energy is adjusted to have proper wavelength and intensity that match the bandgap energy of the semiconducting material (3:8-31).

At the time of the invention, one with ordinary skill in the art would have found it obvious to modify the photolytic device of Nozik by experimenting with the wavelength of the artificial light disclosed by Grantham because doing so would allow one to find light with wavelength range that match the characteristic of the semiconductor material (Grantham, 3:8-31). Moreover, the semiconductor material of Nozik has the bandgap energy in the ultraviolet light spectrum as addressed above; therefore, it is in the best interest of one skilled in the art to adjust the wavelength of the artificial light to include the ultraviolet light spectrum to match the bandgap energy of the semiconductor material.

Addressing claim 43, figure 3 of Nozik shows that the counter electrode 34 is electrically connected to electrical conductor 32.

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10. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nozik (US 4,011,149) in view of Grantham (US 4,203,814) with further evidence provided by Murdoch et al. (US 5,362,373) and Nieda et al. (US 2003/0076028) as applied to claims 1-14, 33 and 39-43 above, and further in view of Gordon (US 4,650,554).

Addressing claim 15, Nozik is silent regard the photolytic coating further comprising a disproportionation catalyst.

Gordon a photoelectrolytic apparatus for generating oxygen and hydrogen gases from water (1:5-9); wherein, the catalyst for evolving oxygen comprises both TiO_2 and MnO_2 (5:56-62).

At the time of the invention, one with ordinary skill in the art would have found it obvious to modify the catalyst layer of Nozik with the MnO_2 catalyst of Gordon because the catalyst that comprises both TiO_2 and MnO_2 according to Gordon is effective at evolving oxygen (Gordon, 5:56-62).

Allowable Subject Matter

11. Pending the double patenting rejection over the claims 1-32 of the U.S. Patent No. 7,527,770 as addressed above, claims 16-32 and 35-38 are allowable for the reason indicated in the Office Action mailed on 07/09/2008.

Response to Arguments

12. Applicant's arguments with respect to claims 1-15, 33 and 39-43 have been considered but are moot in view of the new ground(s) of rejection. Grantham was relied on for the disclosure of the newly added "an artificial" light limitation.

With respect to applicant's assertion that Nozik teaches away from an artificial light source because he desires to capture solar radiation, this argument is not persuasive for the following reasons. One recognizes that the photolytic device of Nozik cannot function when the sun is down; therefore, the modification addressed above with the artificial light of Grantham would allow the photolytic device of Nozik to operate even when the sun is down or in the condition where solar radiation is lacking.

With respect to the double patenting rejection of claims 1-33 and 35-43 over claims 1-32 of application 10/485,934, which is now U.S. Patent No. 7,527,770, Examiner noticed the terminal disclaimer filed in application 10/485,934 over current application; however, a terminal disclaimer over the 10/485,934 application is still required to obviate the double patenting rejection for the prosecution of current application. Applicant relied on MPEP 1490 to indicate that a terminal disclaimer is not needed in this application, Examiner respectfully requests Applicant to indicate the section of MPEP 1490 that addresses current issue.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BACH T. DINH whose telephone number is (571)270-5118. The examiner can normally be reached on Monday-Friday EST 7:00 A.M-3:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on (571)272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

BD
06/02/2009